

**WHAT IS CLAIMED IS:**

1. A method of determining a next hop address using a unified cache, the method comprising the steps of:

(a) determining whether a destination node is onlink or offlink based on a unified cache storing information regarding a plurality of nodes linked to a predetermined network;

(b) detecting from the unified cache an entry storing a network layer address that matches a network layer address of the destination node if the destination node is determined as onlink in step (a); and

(c) determining a link layer address stored in the entry detected in step (b) as a link layer address of a next hop node.

2. The method of claim 1, wherein the predetermined network is an Internet Protocol version 6 (IPv6) link local network, and the unified cache comprises an IPv6 destination cache, an IPv6 neighbor cache, an IPv6 basic router list, and an IPv6 prefix list which are unified.

3. The method of claim 1, wherein step (a) comprises:

(a-1) detecting from the unified cache an entry storing information regarding a router among the nodes, and

(a-2) comparing a prefix portion of a network layer address stored in the entry detected in (a-1) with a prefix portion of the network layer address of the destination node to determine whether the destination node is onlink or offlink.

4. The method of claim 1, further comprising the steps of:

- (d) requesting all of the nodes connected to the predetermined network to transmit a link layer address of the destination node if the entry is not detected in step (b); and
- (e) receiving the link layer address transmitted from the nodes and determining the received link layer address as the link layer address of the next hop node.

5. The method of claim 4, further comprising the step of (f) updating the unified cache using the received link layer address,

wherein step (a) comprises determining whether the destination node is onlink or offlink based on the updated unified cache.

6. The method of claim 1, further comprising:

- (d) detecting from the unified cache an entry storing a network layer address that matches a network layer address of the destination node if the destination node is determined as offlink; and
- (e) determining a link layer address stored in the entry detected in (d) as the link layer address of the next hop node.

7. The method of claim 6, further comprising determining the link layer address of a router among the nodes as the link layer address of the next hop node if the entry is not detected in (d).

8. An apparatus for determining a next hop address, the apparatus comprising:

an on-off-link determining unit that determines whether a destination node is onlink or offlink based on a unified cache storing information regarding plurality of nodes connected to a predetermined network;

an onlink equal address entry detecting unit that detects from the unified cache an entry storing a network layer address that matches a network layer address of the destination node if the destination node is determined as onlink; and

a first link layer address determining unit that determines a link layer address stored in the entry detected by the onlink equal address entry detecting unit as a link layer address of a next hop node.

9. The apparatus of claim 8, wherein the predetermined network is an IPv6 link local network, and the unified cache comprises an Internet Protocol version 6 (IPv6) destination cache, an IPv6 neighbor cache, an IPv6 default router list, and an IPv6 prefix list which are unified.

10. The apparatus of claim 8, further comprising a router entry detecting unit that detects from the unified cache an entry storing information on a router among the nodes, wherein the on-off-link determining unit determines whether the destination node is onlink or offlink by comparing a prefix portion of a network layer address stored in the entry detected by the router entry detecting unit with a prefix portion of the network layer address of the destination node.

11. The apparatus of claim 8, further comprising a second link layer address determining unit that requests all of the nodes connected to the predetermined network to transmit a link layer address of the destination node if the entry is not detected by the on-off-link equal address entry detecting unit, receives the link layer address transmitted from the nodes, and determines the received link layer address as the link layer address of the next hop node.

12. The apparatus of claim 8, further comprising:  
an offlink equal address entry detecting unit that detects from the unified cache an entry storing a network layer address that matches the network layer address of the destination node if the destination node is determined as offlink; and  
a third link layer address determining unit that determines a link layer address stored in the entry detected by the offlink equal address entry detecting unit as the link layer address of the next hop node.

13. The apparatus of claim 12, further comprising a fourth link layer address determining unit that determines the link layer address of a router among the nodes as the link layer address of the next hop node if the entry is not detected by the offlink equal address entry detecting unit.

14. A method of constructing and utilizing a unified cache, the method comprising the steps of:

(a) receiving information regarding a plurality of nodes connected to an Internet Protocol version 6 (IPv6) link local network and unifying an IPv6 destination cache, an IPv6 neighbor cache, an IPv6 default router cache, an IPv6 prefix cache based on the information received from the nodes to construct the unified cache; and

(b) determining a link layer address of a next hop node based on the unified cache.

15. The method of claim 14, wherein the unified cache comprises entries including an onlink field storing a value indicating whether a destination node is onlink or offlink and a link layer address field that stores a link layer address of the destination node if the destination node is onlink and stores a link layer address of an onlink router if the destination node is offlink.

16. The method of claim 14, further comprising the steps of:

(c) creating a link local address of the predetermined network and detecting a node that has the same address as the created link local address; and

(d) requesting a router among the nodes to transmit information regarding the router by using the created link local address as a sender address if the node having the same address as the created link local address is not detected in step (c),  
wherein step (a) comprises receiving the information transmitted from the router.

17. The method of claim 14, wherein (b) further comprises the steps of:

determining whether a destination node is onlink or offlink based on information on a router stored in the unified cache; and

determining a link layer address of the destination node determined as onlink as the link layer address of the next hop node.

18. A computer readable medium having embodied thereon a computer program for a method of determining a next hop address,

wherein the method comprises:

determining whether a destination node is onlink or offlink based on a unified cache storing information regarding a plurality of nodes linked to a predetermined network;

detecting an entry storing a network layer address that matches a network layer address of the destination node if the destination node is determined as onlink; and

determining a link layer address stored in the detected entry as a link layer address of a next hop node.

19. A computer readable medium having embodied thereon a computer program for a method of constructing and utilizing a unified cache,

wherein the method comprises:

receiving information regarding nodes connected to an Internet Protocol version 6 (IPv6) link local network and unifying an IPv6 destination cache, an IPv6 neighbor cache, an IPv6 default router cache, an IPv6 prefix cache based on the information received from the nodes to construct the unified cache; and

determining a link layer address of a next hop node based on the unified cache.